

# PATENT SPECIFICATION

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## (54) GEL-FORMING COMPOSITION

(71) We, MERCK & CO., INC., a corporation duly organized and existing under the laws of the State of New Jersey, United States of America, of Rahway, New Jersey, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a composition for preparing an acidified milk or cream gel product.

It has long been desired to successfully prepare a food product in which milk and acid juices, especially fruit juices, were blended to provide valuable nutritional advantages. There are inherent difficulties, however, in combining milk, which has a tendency to curdle, with fruit juice having a relatively high acid content. Products which have been produced lack palatability, in many cases have lost essential vitamins, or are devoid of "lasting" qualities so that they deteriorate rapidly.

This invention provides a gel-forming composition for gelling a blend of milk or cream and acid e.g. fruit juices. Using such compositions it is now possible to prepare a palatable, high protein beverage or other food products which will remain stable. In such stable products the acid juice will remain within the product, as a finely divided widely dispersed mixture, providing uniformity of flavor without noticeable particles or any graininess.

To accomplish this result, this invention provides a thickener system which is a blend of carboxymethyl cellulose, locust bean gum, and xanthan gum. The amounts of each component are as follows (percents based on weight of the total thickener composition and the total is 100%):

carboxymethyl cellulose	from 30% to 50%
locust bean gum	from 10% to 45%
xanthan gum	from 20% to 50%

Within the above broad ranges, certain ideal levels for specific formulations have

been found, depending on whether the final product is processed using cold or hot temperatures. The optimum composition for cold processing usage contains from 20 to 35% xanthan gum, from 20% to 45% locust bean gum, and from 30% to 50% carboxymethyl cellulose (total is 100%). For hot processing, from 35% to 50% xanthan gum, from 15% to 20% locust bean gum, and from 30% to 50% carboxymethyl cellulose is used (total is 100%).

The chosen amount of each component can be dry mixed together, with sugar if desired, and added to the milk, followed by addition of the fruit juice. Alternatively, the thickeners can be added separately, first adding carboxymethyl cellulose to the milk, followed by addition of the fruit juice and the locust bean gum and and xanthan gum. The final blend can be heated, or not, as desired during preparation. Slight changes of the amounts of the individual thickener components can be made, depending on whether cold or hot processing is chosen, as illustrated in the examples which are set forth in more detail below.

The thickener composition, as defined above, is used in the final milk-fruit juice product in an amount between 0.6% and 1%, when the mixture is prepared hot, or from 0.85% to 1.6%, when the mixture is prepared cold, based on weight of the final volume amount. When prepared hot the mixture is heated to a temperature from 150 to 170°F for from 30 to 60 minutes. The final liquid volume is the volume total of the milk and the fruit juice. Generally, the milk-fruit juice is used in approximately equal amounts by volume of each.

It is noted that the use of carboxymethyl cellulose as a protein stabilizer has been taught in the literature, see C.A., 56 1816b; C.A., 78, 83016u. In addition, carboxymethyl cellulose has been used in a milk-fruit juice beverage, see Shenkenberg et al., *Food Engineering*, 43, No. 4, April 1971. It has been found that carboxymethyl cellulose alone in a milk-fruit juice blend, at a level

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below 0.35%, does not form a gel, but a liquid product.

Also taught in the literature is the use of xanthan gum and locust bean gum to thicken acidified milk products, see U.S. 3,726,690. In this case, as in the literature above, the milk products have a high fat content, see the Examples of that Patent. When experiments were carried out using low fat content milk-fruit juice blends thickened with xanthan gum-locust bean gum alone, there was observed a graininess of texture which is highly undesirable.

It is therefore apparent that the focus of this invention is the discovery that milk-fruit juice blends can be prepared having superior characteristics using the synergistic effects of a mixture of carboxymethyl cellulose and xanthan gum-locust bean gum. It was also found that the pH of the final products could be reduced substantially lower (to below 4.5) than those products prepared in the prior art, with a resultant improved flavor, even with the low fat levels present. The thickener composition is useful down to a pH range of from 3 to 4.5.

Suitable fruit juices are orange, Hawaiian Punch, black cherry, crab apple, papaya, mango, grape, cranberry, lemon-lime, grapefruit, but this list is non-limiting, and many suitable fruits and juices will occur to those skilled in the art.

This invention is further illustrated by the following examples:

#### EXAMPLE 1

Gel Made by One-Step "Hot" Process

The final level of the components of the system are as follows:

##### Ingredients

	Hawaiian Punch	Black Cherry	Orange
Flavour			
Xanthan gum	0.37	0.37	0.37
Locust bean gum	0.15	0.15	0.15
Milk	45.00	45.00	45.00
Juice (reconstituted frozen concentrate 2×1)	45.00	45.00	45.00
Sugar	8.98	8.98	8.88
Carboxymethyl cellulose	0.30	0.30	0.30
Citric Acid	0.20	0.20	0.30
Total	100.00	100.00	100.00
(total thickener content)	0.82	0.82	0.82

Total fat content of system: 1.58%; 1.58%; 1.58%.

The carboxymethyl cellulose blended with half the sugar, is added to milk while stirring, and stirring is continued for 15 minutes. The fruit juice (frozen reconstituted 2×1 (i.e. dilution to twice its volume), and acidified with citric acid), is then added to the milk and mixed. The xanthan gum, and locust bean gum blended with the rest of the sugar, is

Ingredients	Percent by Weight	
Xanthan gum	0.35	
Locust bean gum	0.14	
Carboxymethyl cellulose	0.30	
Total thickener content	0.79	
Milk	45.00	45
Juice (Hawaiian Punch, reconstituted frozen 2:1)	45.00	
Sugar	9.01	
Citric acid	.20	
Total fat content of system	1.58%	50

A blend of xanthan gum (44 wt %), locust bean gum (18 wt %), and carboxymethyl cellulose (38 wt %), is dry mixed, then blended with the sugar. This blend is added to milk at room temperature and mixed for about 1—2 minutes. The fruit juice, to which is added the citric acid, is then added to the milk mixture and blended with stirring. The final pH is 3.9. While stirring is continued, the mixture is heated to 160°F. for 30 minutes. The hot mixture is then packaged, by pouring into decorative trays or another suitable container in the desired serving quantity. The mixture is then cooled to below 40°C., and is ready for consumption or shipping.

#### EXAMPLE 2

Gel Made by Two-Step "Hot" Process

The following formulations were prepared using the process herein described:

then added to the liquids while stirring. Final pH is 4.1. Under continuous stirring, the mixture is heated to 160°F. for 30 minutes. The mixture is then packaged cooled to below 40°C. and consumed, or shipped.

#### EXAMPLE 3

The orange flavour formulation is Example 2 was modified to prepare a orange juice flavored gel using a "cold" process. The

same general procedure was followed, except that no heat was applied while stirring, and stirring was continued at low speed after all ingredients were added, for seven minutes.

	Ingredients	Percentage
	Xanthan gum	0.24
5	Locust bean gum	0.40
	Carboxymethyl cellulose	0.30
	Milk	45.00
	Orange juice (reconstituted frozen 2×1)	45.00
	Sugar	8.86
10.	Citric Acid	0.20
	Total	100.00

#### EXAMPLE 4

Showing Synergistic Effect of the Thickener Blend Components

15 A gel made by the one-step "hot" process, Example 1 above, was compared with two mixes made using identical food ingredients, but with either carboxymethyl cellulose or the xanthan gum—locust bean gum blend as thickener.

	Thickener	Percent Thickener	Fat Level	Quality of Texture
	Example 1 blend	.79	1.58	Excellent, smooth, tender gel
20	Carboxymethyl cellulose	.3	1.58	Smooth viscous non-gelled liquid
	Xanthan gum/ locust bean gum	.35/.14	1.58	Non-gelling, grainy

#### EXAMPLE 5

25 Following the procedure of Example 1, the following formulations are prepared into a juice-flavored gel using a "hot" process and a gum blend consisting of 39.4% xanthan gum, 15.2% locust bean gum and 45.4% carboxymethyl cellulose.

	I. Formulation	(A)	(B)
30	Xanthan Gum, food grade	.26	.26
	Locust Bean Gum	.10	.10
	Carboxymethyl cellulose	.30	.30
	Sugar	9.09	9.09
35	Citric Acid, anhydrous	.25	.25
	Juice (Hawaiian Punch reconstituted)	45.00	45.00
	(A) Half & Half Cream (11.3% Fat)	45.00	—
40	(B) Cream mix (7.25% Fat)	—	45.00
	Final Gel Fat Level		
	(A) 5.6% Fat		
	(B) 3.6% Fat		

45 The acid gels from formulations A and B each had a smooth body exhibiting no graininess indicative of protein precipitation. The gels had a richer taste than those using low fat due to the increase of fat content.

50 Similar results are obtained using either of the above formulations with the procedure of Example 2.

55 As can be seen from the examples, compositions provided by the present invention can produce milk and acid juice products such as beverages or desserts without the necessity for chemical neutralizers. It is readily possible

to prepare highly palatable products having a high protein content, a smooth and creamy consistency, a tender body, a firm moldable texture, and a relatively long life without deterioration. Preferred products are milk and acid fruit juice beverages or desserts using low fat milk (low fat milk is generally accepted in the industry to be below 2% fat content), though milk with a higher fat content, and cream, can be used.

Furthermore, compositions provided by this invention facilitate the production of milk and acid juice products which may be pack-

aged and distributed through ordinary channels and with a minimum of refrigeration, together with the normal commercial distribution and sale of fresh milke or fruit juices.

- 5 It is to be noted that other acid food juices, in addition to fruit juices, can be used to prepare flavored milk or cream food products in accordance with the present invention.

#### WHAT WE CLAIM IS:—

- 10 1. A gel-forming composition comprising from 20% to 50% xanthan gum, from 10% to 45% locust bean gum, and from 30% to 50% carboxymethyl cellulose, the percentages being based on the total weight of the gel-forming composition and chosen so that the total is 100%.

- 15 2. A composition as in Claim 1 which has the following components:

- 20 xanthan gum from 35% to 50%  
locust bean gum from 15% to 20%  
carboxymethyl cellulose from 30% to 50%

3. A composition as in Claim 2 which has the following components:

- 25 xanthan gum about 45%  
locust bean gum about 18%  
carboxymethyl cellulose about 37%

4. A composition as in Claim 1 which has the following components:

- 30 xanthan gum from 20% to 35%  
locust bean gum from 20% to 45%  
carboxymethyl cellulose from 30% to 50%

5. A composition as in Claim 4 which has the following composition:

- 35 xanthan gum about 26%  
locust bean gum about 42%  
carboxymethyl cellulose about 32%

6. A process for making an edible gelled food composition comprising milk and fruit juice or cream and fruit juice, the gelled composition having a pH below 4.5, which process comprises adding to milk or cream at ambient temperature between 0.6% and 1% by weight based on final weight of the food product of a gel-forming composition as in Claim 1 and then adding about the same weight of fruit juice as the milk or cream.

7. A process according to Claim 6 wherein the final mixture is heated to a temperature of from 150 to 170°F. for from 30 to 60 minutes.

8. A process according to claim 6 or 7 wherein the product has a fat content below 2%.

9. An edible gelled food composition comprising milk and fruit juice or cream and fruit juice thickened with from 0.6 to 1.6% of a thickener composition as in claim 1, the gelled composition having a pH below 4.5.

10. A feed composition according to claim 9 having a fat content below 2%.

11. A gelled food product comprising a blend of milk or cream and acid juices gelled by a gel-forming composition comprising carboxymethyl cellulose, xanthan gum and locust bean gum.

12. A process for preparing a food product according to claim 11 substantially as hereinbefore described.

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